Collins Avionics &
Communications Division
Rockwell International Corporation
350 Collins Road NE
Cedar Rapids, IA 52498
319.395.1000

Rockwell *Defense Electronics*

Collins

11 April 1996

In Reply Refer to: MJK0496-15

Department of the Navy
Office of Naval Research
800 North Quincy Street
Ballston Centre Tower 1
Arlington, VA 22217-5660

Attention: David S. Siegel/ONR 351:DSS
Program Officer

Subject: Contract N00014-96-C-0089

Dear Mr. Siegel:

Collins Avionics & Communications Division (CACD), Rockwell International Corporation, submits as Enclosure (1) a Monthly Technical Status Report in accordance with Data Item Number A002.

A copy of the initial invoice is also forwarded as Enclosure (2) and provided for informational purposes only. A copy of this invoice has been forwarded to the local DCAA office for approval.

If there are any questions, please contact the undersigned at telephone (319) 395-3214, M/S 121-200, or FAX (319) 395-4784.

Sincerely,

M J Kach

M. J. Kach
Contract Manager

jlw

c: Director, Naval Research Laboratory
Attn: Code 2627
Washington, D.C. 20375

Defense Technical Information Center
8725 John J. Kingman Road
STE 0944
Ft. Belvoir, VA 22060-6218

S. Perry (DCMC) 168-100
J. Close (DCMC) 168-100

bc: R. Menti 137-117
J. Kendrick 108-174

DATA LINK SOLUTIONS
GEC-MARCONI / ROCKWELL COLLINS DATA LINK SOLUTIONS L.L.C.
Send all correspondence c/o Rockwell Collins, Inc., 350 Collins Road, N.E., Cedar Rapids, IA 52498

04 December 1997 MJK 1297-04

Department of the Navy
Office of Naval Research
800 North Quincy Street
Ballston Centre Tower 1
Arlington, VA 22217-5660

Attn: James Chew 1ONR351: DSS
Program Office

Subject: Contract N00014-96-C-0089
Surgical Strike Program

Dear Mr. Chew:

Collins Avionics & Communications Division submits Enclosure 1, financial summary/status, for the subject program. The associated Technical Progress Report (CDRL A001) will be forwarded under separate cover by 19 December 1997.

If there are any questions, please contact the undersigned at (319) 295-3214.

Sincerely,

M. J. Kach
Contract Manager

Enclosure

c: Director, Naval Research Laboratory
Attn: Code 2627
Washington D. C. 20375

Defense Technical Information Center
8725 John J. Kingman Road
STE 0944
Ft. Belvoir, VA 22060-6218

S. Perry (DCMC) 168-100
J. Close (DCMC) 168-100

DIAMOND THERMAL MANAGEMENT
PROGRAM FINANCIAL STATUS
in (000's)

		CUM THRU SEPT			AT COMPLETION		
W.B.S	DESCRIPTION	PLANNED EXPEND	ACTUAL EXPEND	%COMPL	BAC	LRE	REMARKS
1.0	Rockwell	$ 127	$ 140	41%	$ 238	$ 271	$ 4K increase from prior.
3.0	GHz Technology	232	128	63%	232	232	No change from prior.
4.0	Crystalline Materials Corporation	559	482	88%	559	559	No change from prior.
5.0	MA/COM	163	48	54%	163	163	No change from prior.
6.0	Diamonex	339	326	99%	339	339	No change from prior.
7.0	Phase II	-	-		-	-	
	Subtotal	**1,420**	**1,124**	**76%**	**1,531**	**1,564**	
	Unallocated Resources	-	-		72	42	
	G&A	173	136		205	202	
		173	**136**		**277**	**244**	
	TOTAL COST	**$ 1,593**	**$ 1,260**		**$1,808**	**$1,808**	
	COST OF MONEY & PROFIT				**152**	**152**	
	TOTAL AT SELL				**$1,960**	**$1,960**	

***Actual Expenditures include only those invoices that have been entered into the accounting system. Invoices that were received, and not paid before September 26, 1997 are not included.

Is the current funding sufficient for the current FY?	Yes
What is the next FY's funding requirement at current anticipated levels?	N/A - Fully funded
Have you included in the report narrative any explanation of the above data and are they cross-referenced?	N/A

DEPARTMENT OF THE NAVY
OFFICE OF NAVAL RESEARCH
SEATTLE REGIONAL OFFICE
1107 NE 45TH STREET, SUITE 350
SEATTLE WA 98105-4631

IN REPLY REFER TO:

4330
ONR 247
11 Jul 97

From: Director, Office of Naval Research, Seattle Regional Office, 1107 NE 45th St., Suite 350, Seattle, WA 98105
To: Defense Technical Center, Attn: P. Mawby, 8725 John J. Kingman Rd., Suite 0944, Ft. Belvoir, VA 22060-6218

Subj: RETURNED GRANTEE/CONTRACTOR TECHNICAL REPORTS

1. This confirms our conversations of 27 Feb 97 and 11 Jul 97. Enclosed are a number of technical reports which were returned to our agency for lack of clear distribution availability statement. This confirms that all reports are unclassified and are "APPROVED FOR PUBLIC RELEASE" with no restrictions.

2. Please contact me if you require additional information. My e-mail is *silverr@onr.navy.mil* and my phone is (206) 625-3196.

ROBERT J. SILVERMAN

Enclosure (2)

Standard Form 1034
Revised October 1987
Department of the Treasury
TFM 4-2000
1034-122

PUBLIC VOUCHER FOR PURCHASES AND SERVICES OTHER THAN PERSONAL

VOUCHER NO. BVN- 0001

U.S. DEPARTMENT, BUREAU, OR ESTABLISHMENT AND LOCATION
DFAS-Columbus Center/Gateway
Contract Acctg. Division
Attn: DFAS-CO-CB
P.O. Box 182251
Columbus, Ohio 43218-2251

DATE VOUCHER PREPARED: April 08, 1996

CONTRACT NUMBER AND DATE: N0001496C0089

REQUISITION NUMBER AND DATE:

SCHEDULE NO.

PAID BY

PAYEE'S NAME AND ADDRESS
Rockwell
Collins Avionics & Communications Division
360772
P.O. Box 361347
Columbus, OH 43236-1347

DATE INVOICE RECIEVED

DISCOUNT TERMS

PAYEE'S ACCOUNT NUMBER

SHIPPED FROM | TO | WEIGHT | GOVERNMENT B/L NUMBER

NUMBER AND DATE OF ORDER	DATE OF DELIVERY OR SERVICE	ARTICLES OR SERVICES (Enter description, item number of contract or Federal supply schedule, and other information deemed necessary)	QUANTITY	UNIT PRICE COST	UNIT PRICE PER	AMOUNT ([1])
	1 THRU 3/29/96	Cost in Accordance with Cumulative Statement Attached				81,938.80
		Fee in Accordance with Cumulative Statement Attached				6,973.37
		COST REIMBURSABLE PROVISIONAL PAYMENT				

(Use continuation sheets if necessary) (Payee must NOT use the space below) TOTAL 88,912.17

PAYMENT:
- ☐ PROVISIONAL
- ☐ COMPLETE
- ☐ PARTIAL
- ☐ FINAL
- ☐ PROGRESS
- ☐ ADVANCE

PROVISIONAL PAYMENT SUBJECT TO LATER AUDIT

EXCHANGE RATE = $1.00

BY [2]

TITLE

DIFFERENCES

Amount verified; correct for 88,912.17

(Signature or initials)

Pursuant to authority vested in me, I certify that this is correct and proper for payment

(Date) (Authorized Certifying Officer) [2] (Title)

ACCOUNTING CLASSIFICATION

PAID BY

CHECK NUMBER	ON ACCOUNT OF U.S. TREASURY	CHECK NUMBER	ON (Name of bank)
CASH $	DATE	PAYEE [3]	

PER

TITLE

1 When stated in foreign currency, insert name of currency.
2 If the ability to certify and authority to approve are combined in one person, one signature only is necessary, otherwise the approving officer will sign in the space provided, over his official title.
3 When a voucher is receipted in the name of a company or corporation, the name of the person writing the company or corporate name, as well as the capacity in which he signs, must appear. For example: "John Doe Company, per John Smith, Secretary", or "Treasurer", as the case may be.

Previous edition usable

NSN 7540-00-634-4206

PRIVACY ACT STATEMENT
The information requested on this form is required under the provisions of 31 U.S.C. 82b and 82c, for the purpose of disbursing Federal money. The information requested is to identify the particular creditor and the amounts to be paid. Failure to furnish this information will hinder discharge of the payment obligation.

☆U.S. Government Printing Office 1989-241-175/80300

ANALYSIS OF COSTS INCURRED

Contract Number	N0001496C0089	**Costs Thru**	3/29/96
Customer Order	23X417	**Billing Number**	0001

	CURRENT BILLING	CUMULATIVE COSTS TO DATE
INCURRED COSTS	81,085.69	81,085.69
COST OF MONEY	853.11	853.11
Fee (8.60 %)	6,973.37	6,973.37
NON-FUNDED COSTS	0.00	0.00
TOTAL BILLABLE COSTS	88,912.17	88,912.17

NOTES:

COSTS	541,430.00
FEE	46,570.00
TOTAL FUNDING	$588,000.00
Fee Limit (85.0 %)	39,584.50

Monthly Status Report

March 1996

for the

Surgical Strike Adaptable Video and Communications System (SS/AVDCS)

Contract No. N00014-96-C-0089

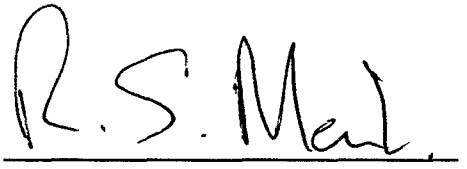
Prepared For:

Office of Naval Research
Washington, D.C.

Prepared By:

Rockwell
Collins Avionics & Communications Division
Cedar Rapids, Iowa

M. H. Brace
Engineering Team Leader
4 Apr 96



R. S. Menti
Program Manager
4 Apr 96

CONTENTS

I. PROGRAM STATUS

Team

The SS/AVDCS contract was awarded to Rockwell on Feb. 9, 1996. The SS/AVDCS Integrated Product Team (IPT) is being formed. Rockwell has placed McDonnell Douglas Advanced Engineering on Letter Contract with full contract expected by mid-April.

McDonnell Douglas F-18 is nearing full contract.

Team list is attached. (Attachment A)

Schedule

Rockwell is detail planning the SS/ADVCS Program using Rockwell's Project Planning & Tracking tool. Schedule to be presented at the April 17 meeting.

Budget

Detail budgets being defined as part of detail planning. Preliminary budgets in place to support kick-off, project planning, initiate systems design, etc. Detail budgets to be in place by end of April.

II. TECHNICAL ACCOMPLISHMENTS

Systems Requirements Definition / Analysis

Systems requirements analysis started. Requirements capture, trade study definition and quality function deployment (QFD) design in progress. Detail review of Link-16 for candidate waveform in progress. RF spectrum allocation and digital data rate requirements trade studies have been abstracted and assigned. Tentative schedule for System Requirements Review (SRR) is August.

The trade studies defined and released to date are attached. (Attachment D)

A baseline QFD chart has been created and is attached. (Attachment E)

Video Compression Development System

Components for a TMS320C80 based video codec system to support compression algorithm development have been ordered. First demonstration of NAWC China Lake and McDonnell Douglas algorithms scheduled for August.

Technical Interchange Meetings

Initial kick-off meetings with Rockwell, McDonnell Douglas and Naval Air Weapon were held Feb. 20-23 in both Cedar Rapids and St. Louis. The minutes of these meetings are attached. (Attachment B)

The SS/AVDCS IPT met with AWW-13, AXQ-14 and ZSW-1 representatives on 28 March 1996 at Eglin AFB to discuss the requirements and lessons learned of the various programs, and to understand applicability and commonality with SS/AVDCS. The list of attendees, a Weapon Data Link Comparison Chart and an updated Surgical Strike Adaptable Video and Data Communications Draft Requirements List based on the discussions are attached. (Attachment C)

III. ACTION ITEMS / ISSUES

Rockwell is in process of creating a summary Action Item/Issues log to capture and status all items identified to date.

IV. PLANS

The next SS/AVDCS Integrated Product Team meeting will be held at Rockwell on April 17 & 18.

ATTACHMENT A

SS/AVDCS Team List

(ssteam.xls)

SURGICAL STRIKE/AVDCS TEAM -- ROCKWELL-CACD

Rockwell Collins, 350 Collins Road NE, Cedar Rapids, Iowa 52498

ONR CONTRACT # N00014-96-C-0089

Name	Organization and Function	PH#'s A/C (319)	FAX#s A/C (319)	E-Mail (@cacd.rockwell.com)	HW/SW
Ron S. Menti	Program Manager	395-8628	395-4317	rmenti	PC/MS Office
Jennifer Gesie	Admin. Assistant	395-1552	395-4317	jgesie	PC/MS Office
Matt Brace	Team Lead/Project Engineer	395-3624	395-4317	mhbrace	PC/MS Office Ver 4.0
Michael J. Kach	Contract	395-3214	395-4784	mjkach	PC/MS Office Ver 4.0
Bob Holmes	Mechanical Engineer	395-5017	395-4317	rhholmes	PC/MS Office Ver 4.0
Bob Liechty	System Engineering	395-	395-4317	rbliecht	PC/MS Office Ver 4.0
Eric Zuber	DSP Engineering	395-3984	395-4317	eozuber	PC/MS Office Ver 4.0
Ray L. Cross	System Engineering	395-8158	395-4317	rlcross	PC/MS Office Ver 4.0
Jim C. Perkins	Marketing	395-5773	395-5111	jcperkin	PC/MS Office Ver 4.0
Vi Helander	Data Management	395-2798		vjheland	PC/MS Office Ver 4.0
Terri May	PP&C	395-1649	395-2001	trmay	
Rockwell STU phone	Rockwell STU - III	393-4300			
Rockwell Video Telecon					
Visitor Control/Security:	Attn: Mary Jane Wilkey 319-395-2787 (voice) 319-395-2528 (fax) mjwilkey@cacd.rockwell.com				

SURGICAL STRIKE/AVDCS TEAM -- MCDONNELL DOUGLAS
J. S. MCDONNELL BLVD., ST. LOUIS, MO
ONR Contract # N00014-96-C-0089

Name	Organization and Function	PH#s A/C (314)	FAX#s A/C (314)	E-Mail Address
Rich Peer		233-6152	232-0271	rpeer@gwsmtp01.mdc.com
John Koly		234-9731	777-1423	
Doug Dreiswerd		233-0585	233-4295	
Visitor Control: PO Box 516 St. Louis, MO 63166-0516	314-233-8110 (Donna Brown-voice) 314-232-2776 (Mary Wiss-voice) 314-234-3124 (fax)			

SURGICAL STRIKE/AVDCS TEAM -- NAWC
1 ADMIN CIRCLE, CHINA LAKE, CA 93555
ONR CONTRACT # N00019-14-96-C-0089

Name	Organization and Function	PH#'s A/C (619)	FAX#s A/C (619)	E-Mail ...chinalake.navy.mil
Rene Lemonnier		939-6389	939-2985	rene_lemonnier@imdgw....
Keith Weisz		939-0457	939-6893	keith_weisz@imdgw.....
Del Perry		939-1028	939-3570	del_perry@cmpogw....
Chuck Creusere		939-4285		chuck@wavelet.....
Butch Spoons		927-3581	939-3298	butch_spoons@imdgw....
Gary Hewer		939-8414		
Visitor Control:	619-939-2181 (voice) 619-939-3996 (fax)			

ATTACHMENT B

Minutes of the SS/AVDCS Kickoff Meeting

20-23 February 1996

(minkomt.doc)

Minutes of the SS/AVDCS Kickoff Meeting 20-23 February 1996.

Summary:

The meeting was held in two locations over the course of the four days. The meeting started on Tuesday at the Rockwell-Collins facilities in Cedar Rapids, Iowa and continued to Wednesday afternoon at which time the meeting recessed and moved to MDA facilities in St. Louis, Missouri for the Thursday and Friday session.

The meeting was oriented around creating a discussion forum for consideration of the requirements for the Surgical Strike data link. These discussions were seeded through review of several briefings including pre-contract briefing slides and preliminary requirements lists. The discussions resulted in consideration of additional requirements. These requirements which flowed from these discussions will be placed in a chart/matrix (that will be initially developed by Rockwell-Collins). This chart/matrix will be used by the team to develop, validate and prioritize these requirements through a coordinated QFD process over the next several months.

General Discussion:

Attendees at the 20, 21 February 1996 Session at Cedar Rapids, IA

NAME	ORGANIZATION	E-MAIL	TELE/FAX
Bob Liechty	CACD/Engineering	rbliecht@cacd.rockwell.com	319-395-2903
Chuck Creusere	NAWC WPNS - CL	chuck@wavelet.chinalake.navy.mil	619-939-4285
Rich Peer	McDonnell Douglas	rpeer@gwsmtp01.mdc.com	314-233-6152 / 232-0271
Mike Kach	CACD/Contracts	mjkach@cacd.rockwell.com	319-395-3214 / 395-4784
Jim Perkins	CACD/Marketing	jcperkin@cacd.rockwell.com	319-395-5773 / 395-5918
Eric Zuber	CACD/Engineering	eozuber@cacd.rockwell.com	319-395-3987
Ray Cross	CACD/Sys Engr.	rlcross@cacd.rockwell.com	319-395-8158
Ron Menti	CACD/Prgm. Mgr.	rmenti@cacd.rockwell.com	319-395-8628
Matt Brace	CACD/Proj. Engr.	mhbrace@cacd.rockwell.com	319-395-3624
Del Perry	NAWC WPNS - CL	del_perry@cmpogw.chinalake.navy.mil	619-939-1025 / 939-3570
Butch Spoons	NAWC WPNS - CL	butch_spoons@imdgw.chinalake.navy.mil	619-927-3581 / 939-3298
Keith Weisz	NAWC WPNS - CL	keith_weisz@imdgw.chinalake.navy.mil	619-939-0457 / 939-6893

Ron Menti started the meeting with a program overview based on charts prepared in the pre-contract phase for briefings to various PMA's (copies were distributed). General support for the concept of the program has been obtained from PMA-258, PMA-280, PMA-265, and PMA-201. Copies of a letter to that effect signed by Captain Freedman in PMA-258 was distributed at the meeting.

Also distributed at the meeting were copies of a Draft ORD "Operational requirements Document for the Digital Data Link (DDL)" (Revision D, 12/16/94) which was used as a source of many of the discussion requirements.

A "Warrior" program briefing was given by Keith Weisz who indicated that the program was now renamed to "Cruise Missile Real-Time retargeting Demonstration" (CMRTRD). This program has need of a communication system for which the Surgical Strike program may provide the answer. The briefing was presented to initiate discussion on the possible requirements.

A tour was given by Rockwell-Collins of their Weapon Data Link Lab, MMIC area, JTIDS (Link-16) production area, and computerized communication analysis tools. These tours/demos were presented as background information for facilitating discussions of activities that would be conducted on the program.

Detailed discussions were conducted based on a prepared list of requirements drawn from the Draft ORD and a data-link comparison matrix. The data-link comparison matrix and the requirements list were extensively marked up as a result of the two days discussion. Preliminary example trade study schedules were also presented.

Among other topics, considerable discussion occurred in the areas of compression and the needed quality, size, and frame rate issues. No universal conclusion was reached that would satisfy everyone but it was decided to solve the immediate problem by choosing 512 by 512 pixel video 8 bits/pixel at 30 frames per second as the baseline to be demonstrated. This issues underlying this item as many others will be assigned as trade studies in the next several months.

The meeting resumed at the McDonnell Douglas facilities the morning of 22 February with the following attendees.

NAME	ORGANIZATION	E-MAIL	TELE/FAX
Rich Peer	McDonnell Douglas	rpeer@gwsmtp01.mdc.com	314-233-6152 / 232-0271
John Koly	MDA F/A-18	koly@F18BN1.mdc.com	314-234-9731
Jim Meany	MDA AS&T/PW	jmeany@mail.mdc.com	314-232-6261 / 232-0271
Chris Martens	MDA AS&T/PW	martens@mpsn01.mdc.com	
Jim St. Clair	MDA AS&T/PW		314-233-0438
Bob Landy	MDA AS&T/PW		314-232-1338
Joe Grasso	MDA AS&T/PW - AAC		314-234-3003 bld 65 314-233-9815 bld 105
Terry Schmidt	MDA AS&T/PW - AAC		314-234-3003 bld 65 314-233-9815 bld 105
Mike Ernst	MDA F/A-18 CNI		314-232-5031
Bob Recktenwald	MDA F/A-18 A/G Integration		314-233-0674
Rosemary Kaskowitz	MDA F/A-18 A/G Integration		314-233-8989
Eric Zuber	CACD/Engineering	eozuber@cacd.rockwell.com	319-395-3987
Ray Cross	CACD/Sys Engr.	rlcross@cacd.rockwell.com	319-395-8158
Ron Menti	CACD/Prgm. Mgr.	rmenti@cacd.rockwell.com	319-395-8628
Bob Liechty	CACD/Engineering	rbliecht@cacd.rockwell.com	319-395-2903
Butch Spoons	NAWC WPNS - CL	butch_spoons@imdgw.chinalake.navy.mil	619-927-3581 / 939-3298
Keith Weisz	NAWC WPNS - CL	keith_weisz@imdgw.chinalake.navy.mil	619-939-0457 / 939-6893

Briefings were given of the Mission Planning System (TAMPs) and the MDA wavelet algorithm. Tours were conducted on the AAC (Advanced Avionics Center), and the AIC (Aircraft Integration Center). Between the F18 and F15 portions of the AIC tour a briefing on OBTEX (offboard targeting experiment) was presented. A demonstration of a TAMPS system and the compression algorithms was shown. The purpose of these briefings and tours was to provide the background for discussions of how the demonstrations and aircraft integration could be accomplished.

The porting of compression code was discussed. Based on initial discussions started in Cedar Rapids the TI 'C80 system is the initial candidate platform for the demonstrations.

The second (half) day of discussions centered on possible configurations for demonstrating a flyable system in an F-18. It was decided that the best course would lie in making the demonstration system appear exactly like a AN/AWW-13 pod to the aircraft's electrical connections and in its performance. This would permit demonstrations without any software modification (which would be expensive). The only modifications would be "orange wire". Discussion continued as to the required documentation and the responsibility for actual modifications etc. All these issue are part of a continuing investigation.

Several possible trade studies were informally discussed during the course of the four day meeting. Some information gathering activities were made into action items. The other trade studies will be collected, formalized, and distributed over the next several weeks by Rockwell (action item 10). A draft list is attached.

Action items were summarized and enumerated on a black board. These have been compiled and are attached.

Respectfully Submitted,

Ray L. Cross
Systems Engineer Rockwell-Collins

Attachments: Action Item List, Draft Discussion Requirements List, Top Level Trade Study List.

Action Items

#	WHO	WHEN	WHAT
1	Butch Spoons		Check freq availability with Frequency Management Office
2	Rich Peer		Determine data size/rate of 3D SAR (image) data
3	John Koly Keith Weisz	1 Mar	Complete F/A-18 Impact Assessment and coordinate with the F/A-18 Project (MDA and the PMA)
4	Keith Weisz		Find an F/A-18 test aircraft compatible with Software #13C
5	Rich Peer	1 Mar	Review C80 Processor Spec; make recommendations
6	Eric Zuber	1 Mar	Review C80 Processor Spec; make recommendations
7	Rockwell	1 Mar	Determine suitability of Rockwell's TBIP 386-based platform for an SS/AVDCS demo in 1995
8	Rich Peer	1 Mar	Summarize video discussions; 20-23 Feb SS/AVDCS meetings
9	Rockwell/Ray Cross	1 Mar	Revise and distribute requirements list
10	Rockwell/Ron Menti	1 Mar	Task Trade Studies 20-23 Feb SS/AVDCS meetings
11	All	27, 28 Mar	Next meeting at Eglin AFB, FL
12	All	17, 18 Apr	Meeting at Rockwell Cedar rapids, Iowa
13	Butch Spoons		Meeting Summarize for Dr Habayeb
14			Get Dick Johnson's e-mail address at the Lake
15	Rich Peer & John Koly	Mid March	Brief MDC SLAM ER Project on SS/AVDCS Project
16	Butch Spoons		Get AWW-13 Pod / F/A-18 ICD; copy all
17	Butch Spoons		Get IDL Specification; copy all
18	Rockwell	22 Mar	Coordinate agenda for next meeting (Eglin AFB)
19	Rockwell/Ray Cross	1 Mar	Revise Data Link Comparison Chart
20	Rockwell	1 Mar	Send AWW-13 Antenna Info Package to Rich Peer (for John Koly)
21	Rockwell	1 Mar	Send Software Process Manual to Rich Peer (for John Koly)
22	Butch Spoons		Determine benefit of added maneuverability of F/A-18 during missile control period due to omni directional antenna(s)
23	Rich Peer	1 Mar	Send TAMPS Display hardcopy to Ron Menti
24	Chuck Creuscre	1 Mar	Determine transmission BW of 3D images for SAR/LADAR
25	Rockwell	1 Mar	Distribute copies of CDL Spec (Loral)
26	Rockwell/Peer	26 Feb/ Mar	Get MDC on contract with Rockwell
27	NAWC/Koly	mid Mar	Get MDC on contract with USN/NAWC
28	Rockwell	1 Mar	Paper copy of Keith's Warrior Charts to all
29	Rockwell	27 Feb	Distribute team contact list to all
30	Rockwell	1 Mar	Distribute QFD JSOW sample to all
31	Keith Weisz		Determine DD254 status/contract requirements for SS/AVDCS activities on F/A-18 TDL contract.

32	Butch Spoons		Indentify Threat Documents for Jamming Environment
#	**WHO**	**WHEN**	**WHAT**
33	Keith Weisz		Determine what Jammers are available at NAWC for testing
34	Keith Weisz		Get a copy of the LADAR ICD
35			JSTARS transport of SAR data offboard. What format?
36	N/A		POC for Smart Skins is John Koly
37	B.Spoon, R.Peer		Consider effects of image compression on offboard ATR functions.

DRAFT Requirements List

	Surgical Strike Adaptable Video and Data Communications Draft Requirements List				
Item	**Operational Requirements**	**Kick-Off Meeting**	**Draft ORD Para.**	**PEP Warrior Para.**	**Trade Studies**
1a	Podless,		1.0, 1.a, 3.b, 4.		
1b	Command and Video Data Link		1.0, 1.a,		T1.1, T1.2
1c	High A/J		1.0, 1.a, 2.		T2.4
2	Backward compatible with AN/AWW-13		1.a,		
3	Real time command/control data/video DL for imagery and coordinates		1.b, 4.a1	2.1	T1.1, T1.2
4	Non-Interference with other avionics		4.a2,		T3.1, T3.7
5	No new aircraft antennas (objective)		4. a4		T3.3
6	High display resolution -minimize quality degradation. Higher Video quality than AN/AWW-13 - quality sufficient to identify targets		4.a5, 1.d, 3.a.7		T1.1, T1.2
7	Secure and Non-secure modes for DDL		4.a6		T2.6
8	Aviation Environment Carrier Operations (E^3 Environments)		4.a7		
9a	Freeze Frame/Real Time Selectable		4.a8		
9b	100 still frame images stored in memory to be displayed on aircrew command		4.a8		
10a	Low cost with COTS products and Proc.		4.a9		
10b	Maximize use of existing avionics		4.a9		
11a	Service time 10 years, no preventative maintenance required		4.b1		
11b	Aircraft Terminal Shelf life at least 20 years		4.b.4		
11c	Aircraft Terminal Service life at least 20 years		4.b.4		
12	Operational Availability 99%		4.b2		
13	Mission reliability 99.4% ADT 1000 MFHBF WDT threshold 500 MFHBF		4.b3		
14a	Compatible with Mission Planning Systems		4.c, 6.a	4.9	
14b	Compatibility with Data Storage Unit		4.c	4.9	
15	Operational range requirement for AJ from ONI Threat Assessment STAR #017-93 Minimum range ratio for video (?) Minimum range ratio for data (?) Jammer EIRP xx dBw	OPNAV	4.c1		T2.4, T4.1, T4.3
16	Minimum LOS range of xxx nmi	OPNAV	4.c2		T4.2, T4.3
17a	Signal Acquisition/reacquisition < 3 sec		4.d3		T2.2, T2.5, T2.6
17b	command latency < 250 msec (objective <100ms)		4.d3		T2.2, T2.5, T2.6

DRAFT Requirements List

DRAFT Requirements List

Item	Operational Requirements Cont'd	Kick-Off Meeting	Draft ORD Para.	PEP Warrior Para.	Trade Studies
18	360 degree transmission/reception for weapons data terminal (WDT) and (ADT)		3.a.9, 4.d4		T3.3, T4.2
19	≥100 simultaneous data links within a coverage area of xxx nmi communicate on a non interference basis (goal 150)	OPNAV	4.d5		T2.2, T2.3, T3.2, T4.2
20	ADT and WDT BIT		5.a		
21a	No new PSE Complete checkout via external connections Utilize CASS for fault detection: Fault detection rate ≥ 90% Fault isolation rate ≥ 85% False alarm rate ≤ 10%		5.b		
21b	Complete checkout via external connections		5.b		
21c	Utilize CASS for fault detection: Fault detection rate ≥ 90% Fault isolation rate ≥ 85% False alarm rate ≤ 10%		5.b		
22a	BIT Go/No-go reportable to maintenance and aircrew		5.d2		
22b	Periodic BIT Go/No-go		5.d2		
22c	Provide ability to terminate initiated BIT		5.d2		
23	KYK-13 Interface {***Obsolete} and Electronic Key Management System (EKMS) compatible interfaces.		5.d3		T2.6
24	C^3I interface for JSIPS JSIPS-N imagery		6.a		T1.1, T1.2, T4.2
25	MITL Capability		4.a1	3.4.7	
26	Intra-Swarm Operability	21 Feb 96			
27	1760 Video Interface (same as AWW-13)	21 Feb 96			
28	Link 16 XMT & RCV Capable Not simultaneous Link 16 and DDL	21 Feb 96			T2.1, T4.1, T4.2
29	Better A/J than IDL				T2.1, T2.4
30	Graphics Resolution (for Demonstration) 512 x 512 x 8 Image @ 30 Fps				T1.1
31	Support other data types (SAR/LADAR/EO, TBD) or data other than images	21 Feb 96			T1.1, T2.2 T2.3
32	Demonstration Purposes, Acts like AWW-13 1760 Interface	21 Feb 96			

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	Other Requirements Implied by ORD and Other Sources				
Item	**Operational Requirements Cont'd**	**Kick-Off Meeting**	**Draft ORD Para.**	**PEP Warrior Para.**	**Trade Studies**
	RF Link	x	1.a		
	Two way communication (Duplexing/Multiplexing)	x	1.a		
	Terrestrial and airborne platforms (non-satellite). Platforms: aircraft, ships, UAV, PGM's, cruise missiles.	x	1.a, 4.a.2	x	
	Other data applications besides Precision guided Munitions (PGM's)	x	1.a, 3.c	x	
	Relay of Data/Video	x	1.b, 3.c, 4.a.2, 4.a.8	x	
	Video, Data, Command, and Relay functions capable of operating independently of each other.		4.a.2	x	
	Goal: No new aircraft Boxes installable into current avionics (implies cards)		1.c		
	Repackageable configurations		1.c	x	
	Lower weight than AN/AWW-13 Pod		3.a.1	x	
	Cannot Occupy a weapon station (note: covered by Podless requirement)		3.a.2	x	
	Cannot Reduce Engagements per sortie or adversely impact sortie rate.		3.a.2	x	
	Minimize impact radar cross section		3.a.3	x	
	Minimize adverse effect on the survivability of existing and future aircraft.		3.a.3, 4.a.4	x	
	Cannot have adverse jettison properties (Note: podless requirement = no jettison)		3.a.4	x	
	Larger Number of simultaneous "Channels" than AWW-13		3.a.5		
	Technologically up-to-date	x	3.a.7	x	
	Growth Potential	x	3.a.7	x	
	High reliability		3.a.7	x	
	High availability		3.a.7	x	
	Highly maintainable		3.a.7	x	
	Not Analog Video	x	3.a.8		
	Totally New weapon data link standard	x	4.		T1.1, T1.2, T2.1, T2.2, T2.3. T2.4, T2.5, T2.6, T3.1, T3.2
	Avionics to be common to many platforms		4.	x	T3.3.1, T3.3.2, T*
	Compatible with seeker technologies such as Automatic Target Recognition (ATR) and autocueing.	x	4.a.3		
Item	**Operational Requirements Cont'd**	**Kick-Off Meeting**	**Draft ORD Para.**	**PEP Warrior Para.**	**Trade Studies**

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	Compatible with advanced state-or-the-art image processing techniques to enhance jamming resistance.	x	4.a.3		T1.1, T2.3, T1.2, T2.4, T2.5, T3.2
	Number of transmittable commands not limited (allows growth)		4.d.3		
	Minimize personnel workload and training requirements (MPT analysis)		5.c		
	Compatible with aircraft digital buss	x	5.d.1, 6.c		
	Reprogramable over normal digital interface.		5.d.1		
	Software written in ADA		5.d.1		
	50% growth capability in (all computing resources) throughput, main memory, storage memory and I/O channels		5.d.1		
	Use industry standard interface architectures		5.d.4		
	Objective: Compatible with USAF and foreign aircraft		6.c		
	Compatible with existing aircraft displays, recording, and transmission avionics		6.c		
	Comparison Matrix Items				
Item	**Operational Requirements Cont'd**	**Kick-Off Meeting**	**Draft ORD Para.**	**PEP Warrior Para.**	**Trade Studies**
	Handoff - Multiple Aircraft Can Receive one Weapon Link Information; another aircraft could take over command link duties if required.	x			
	Data rate 10 Megabits/sec Unjammed at xx range.				T1.1, T2.3, T1.2, T2.5
	Data rate 100 kb/s to > 1Mb/s Jammed				T1.1, T2.3, T1.2, T2.4, T2.5, T3.2
	Communication System Duty Cycle up to 100% as needed. (No maximum limitation on Duty cycle e.g. Link-16)				T2.1, T2.2, T2.3, T2.4
	Weight (approx.) 50 lbs for Aircraft Install				
	Weight (approx.) 20 lbs for Weapon Install				
	Power Draw on Aircraft <1000 Watts				
	Power Draw on Weapon <500 Watts				
	Volume on Aircraft <700 cu-in				
	Volume on Weapon <350 cu-in				

DRAFT Requirements List

DRAFT Trade Studies List

T1.0 Video Imaging

T1.1 Data Rate Requirements for Various Applications

T1.2 Compression Techniques

T2.0 Modulation Waveforms

T2.1 Link-16/IDL/CDL/WDL

T2.2 Waveform Types

T2.3 Capacity/Users

T2.4 A/J Capability

T2.5 FEC Techniques

T2.6 Encryption

T2.7 CAE Analysis Tool

T3.0 RF

T3.1 RF Spectrum Allocations

T3.2 Jamming Environment/Effectiveness

T3.3 Antenna Requirements/Mods

T3.3.1 Blade Antennas

T3.3.2 Smart Skin Technology

T3.4 CAE Analysis Tools

T4.0 Propagation

T4.1 Effective range vs. Jamming

T4.2 Link Budgets

T4.3 Fading/Multipath

DRAFT Trade Studies List

ATTACHMENT C

Draft Unverified Weapon Data Link Comparison Chart

(dlcmpr.doc)

Surgical Strike Adaptable Video and Data Communications Draft Requirements List

(ssreq2.doc)

List of Meeting Attendees

(att_328.doc)

DRAFT UNVERIFIED Weapon Data Link Comparison Chart

(Unclassified Version)

	AWW-13	AXQ-14	ZSW-1 (IDL)	CDL	Link-16 (JTIDS)	Enhanced Link-16	Surgical Strike (all parameters being developed and subject to change)
Manufacturer - Aircraft Pod or Internal Avionics	NAWC	Hughes	Harris - Magnavox		GEC-Marconi, Lockheed-Sanders Rockwell-Collins	TBD	TBD
Manufacturer - Missile Weapon Data Terminal	Rockwell-Collins, Harris	Harris - Magnavox	Harris - Magnavox		GEC-Marconi, Lockheed-Sanders Rockwell-Collins	TBD	TBD
Podless (No External Aircraft Pod Required)	NO	NO	NO		YES	YES	YES
Operational Frequency Band	Split Weapon Bands	Weapon Band	Weapon Band		969-1206 MHz	969-1206 ? MHz	Weapon Band(s)
Backward Compatibility With Link-16	NO	NO	NO		YES	YES	YES

Draft Unverified Weapon Data Link Comparison Chart (cont.)
UNCLASSIFIED

	AWW-13	AXQ-14	ZSW-1 (IDL)	CDL	Link-16 (JTIDS)	Enhanced Link-16	Surgical Strike (all parameters being developed and subject to change)
Backward Compatibility With AN/AWW-13	YES	NO	NO		NO	NO	YES
Backward Compatibility Features	To AWW-9	*?*	To AXQ-14		NO	Regular Link-16	AWW-13, Link-16 (AXQ-14?, IDL?)
Network Capability (the general ability to share data between more than one weapon and/or aircraft)	Multiple Pods Could Receive Same Video - Different Aircraft Could Handoff Control. No Other Data Sharing	Multiple Pods Could Receive Same Video - Different Aircraft Could Handoff Control. No Other Data Sharing	Single Pod to Weapon Link - No Link or Data Sharing		Multiple Net Participants with full data sharing (if authorized).	Multiple Net Participants with full data sharing (if authorized).	30 to 100 Simulatneous Users (150 Goal) with **at least** partial data sharing among a subset. Multiple Aircraft Can Receive or Control Multiple Weapons.
Handoff Capability	YES	YES	NO Single Pod to Weapon Link - No Link or Data Sharing		YES	YES	YES Multiple Aircraft Can Receive or Control Multiple Weapons.
Video Frame Rate	30 F/s - effectively reduced at low S/N due to Pod Recursive Filtering of Video	30 F/s	15 F/s or 7 frames per second depending on A/J mode. Down to 2 F/s with BTC		Still Frame to several per minute.	Still Frame to several per second.	Still frame or 15 to 30 frames/second.

Draft Unverified Weapon Data Link Comparison Chart (cont.)
UNCLASSIFIED

	AWW-13	AXQ-14	ZSW-1 (IDL)	CDL	Link-16 (JTIDS)	Enhanced Link-16	Surgical Strike (all parameters being developed and subject to change)
Compression (Video and Still)	NONE	NONE	BTC 4:1 spacial, 8:1 temporal / Wavelet 40:1 spacial 4:1 temporal		Compressor Appliqué TBD	Compressor Appliqué TBD	Variable up to approx. 200:1 depending on system needs at any particular time.
Information Transmission Rate Clear (Video/Command)	Analog PM - Baseband Video 2 MHz Bandwidth Command DPSK -- b/s	Analog FM - Baseband Video 4 MHz Bandwidth Command -- b/s	(approx) Video 2 Mbps Command 500 bps		28.8 kbps to 115.2 standard 238 kbps without FEC (all time slots used)	approx 1.5 Mbps unprotected without FEC (all time slots used)	from 100 kb/s to >1 Mb/s Adaptable to channel conditions.
Information Transmission Rate Jamming (Video/Command)	Analog Video 2 MHz Bandwidth Command DPSK -- b/s	Analog FM - Baseband Video 4 MHz Bandwidth Command -- b/s	(approx) Video 1 Mbps or 500 kbps Command 300 bps		28.8 kbps with FEC under Jamming conditions (all time slots used)	?*?	1 kb/s to >100 kb/s Adaptable to channel conditions.
Range in the Clear	> 100 NM	*?*	> 100 NM		300 NM (waveform timing)	300 NM (waveform timing)	> 100 NM
Range in Jamming	--	*?*	--		300 NM (waveform timing)	300 NM (waveform timing)	> 100 NM

Draft Unverified Weapon Data Link Comparison Chart (cont.)
UNCLASSIFIED

	AWW-13	AXQ-14	ZSW-1 (IDL)	CDL	Link-16 (JTIDS)	Enhanced Link-16	Surgical Strike (all parameters being developed and subject to change)
Aircraft System Antenna Coverage	Limited Angle "High" Gain Fixed Beam on Pod	Provides "Omni" Coverage Electronically Steered Beam with Pod	Provides "Omni" Coverage Electronically Steered Beam with Pod		Omni-Directional	Omni-Directional	OMNI or Beam depending on particular platform requirements. Omni coverage will provide performance at least as good as existing systems.
Weapon System Antenna Coverage	Weapon Dependent Generally Omni	Approx. +/- 56 degrees Az. +/- 27 degrees El. or Omni	Approx. +/- 56 degrees Az. +/- 27 degrees El.		Omni-Directional	Omni-Directional	OMNI or Beam depending on particular platform requirements. Omni coverage will provide performance at least as good as existing systems.
Requirement for on time - Continuous TX for the System Data transfer for on weapon/aircraft communication link.	Intermittent or Continuous Video - Intermittent or Continuous Command Link -	Intermittent or Continuous Video - Intermittent or Continuous Command Link -	Time Division - Fast Alternating Transmit and Receive continuous handshaking required.		Pulse - Low Duty Cycle	Pulse - Moderate duty cycle	Variable On time as required up to 100%

Draft Unverified Weapon Data Link Comparison Chart (cont.)
UNCLASSIFIED

	AWW-13	AXQ-14	ZSW-1 (IDL)	CDL	Link-16 (JTIDS)	Enhanced Link-16	Surgical Strike (all parameters being developed and subject to change)
Transmit and Receive - Duplexing	Separate Frequency Bands	Split Weapons Band	Same Band - Time Sharing		Same Band - Time Sharing and CDMA	Same Band - Time Sharing and CDMA	Transmit/Receive Duplexing under study Time Sharing CDMA, and Frequency Division Multiplexing..
Flexibility / Adaptability of Transmission Rates and Compression for Clear vs. Jamming	NO- video compression NO - command link adaptability YES - Recursive Filtering on Video Receiver to automatically adapt to channel noise	NO- video compression NO - command link adaptability	YES - Several Pilot Selectable Compression/ Transmission Rates.		YES - Several time slot data structures with variable immunity. Under some condition system automatically adapts (reduces data rate) ("Compression " is application dependent)	TBD ("Compression " is application dependent)	YES Command Link and Video Link are automatically adjusted to match channel conditions. Variable Compression is used on Video Link to achieve "best" quality at lower rates.
Link Acquisition Time (Fine Sync)	Video: 6 to 8 seconds initial 2 seconds subsequent Command: <500 ms	Video *?* Command *?*	Video and Command __ Seconds initial __ Seconds subsequent		__ Seconds	__ Seconds	< 3 Seconds

Draft Unverified Weapon Data Link Comparison Chart (cont.)
UNCLASSIFIED

	AWW-13	AXQ-14	ZSW-1 (IDL)	CDL	Link-16 (JTIDS)	Enhanced Link-16	Surgical Strike (all parameters being developed and subject to change)
Error Correction Coding Gain	Analog Receive Processing - _ dB	NONE	__ dB		At Lower Bit Rates __ dB	At Lower Bit Rates __ dB	Variable Depending on channel Conditions __dB to __ dB
A/J Capability	LOW Video Recursive Filtering	Video Receiver *?* Pulse Jam Rejection.	Moderate to High Digital Techniques, Compression, and Spread Spectrum		Moderate to High Digital Techniques and Spread Spectrum	Low to High Digital Techniques and Spread Spectrum	High Digital Techniques, Compression, Advanced Waveforms and Spread Spectrum
J/S (Jammer to Signal) Performance @ Maximum Data Rates	Video J/S -- dB Command J/S - - dB	*?*	Video J/S -- dB Command J/S - - dB		-- dB	-- dB	Variable Depending on channel Conditions Minimum -- dB
J/S (Jammer to Signal) Performance @ Minimum Data Rates	Video J/S -- dB Command J/S - - dB	*?*	Video J/S -- dB Command J/S - - dB		-- dB	-- dB	Variable Depending on channel Conditions Minimum --dB

Draft Unverified Weapon Data Link Comparison Chart (cont.)

UNCLASSIFIED

	AWW-13	AXQ-14	ZSW-1 (IDL)	CDL	Link-16 (JTIDS)	Enhanced Link-16	Surgical Strike (all parameters being developed and subject to change)
Interference Potential (EMC)	Analog Video System Vulnerable to Cochannel Interference	Analog Video System Vulnerable to Cochannel Interference	Could Cause Interference to Analog Systems in Same Band		Usage and Maximum Data Rates Restricted by NTIA SPS WG-1 TR-91-001 Rev A. Due to Potential for Interference With Transponder (IFF) and DME (TACAN)	Usage and Maximum Data Rates Restricted by NTIA SPS WG-1 TR-91-001 Rev A. Due to Potential for Interference With Transponder (IFF) and DME (TACAN)	Could Cause Interference to Analog Systems in Same Band
Weight (aircraft package)	approx. 720 lbs. pod	*?*	approx. 425 lbs pod.		approx. 50 lbs.	approx. 50 lbs.	approx 25 lbs. weapon side. approx 50 lbs. aircraft side.
Estimated Cost (aircraft/missile)	$500K/60K	*?*	$500K/88K		$375K/125K	$375K/125K	$50K/25K
Non-Interference and A/J Capability with Multiple Users	Low	*?*	Moderate to High		HIGH	*?*	HIGH

Draft Unverified Weapon Data Link Comparison Chart (cont.)
UNCLASSIFIED

	AWW-13	AXQ-14	ZSW-1 (IDL)	CDL	Link-16 (JTIDS)	Enhanced Link-16	Surgical Strike (all parameters being developed and subject to change)
Number of Simultaneous Users in the Same Geographical Target Area	__ Non interfering	*?*	8 to 10 Users		20 Nets ** Users per net (dependent on traffic loading)	*?* << 51 Nets (Based on number of frequencies) *?* Users per net (dependent on traffic loading)	30 to 100 simultaneous users . Goal: 150 simultaneous users
Joint Service	Navy Only	Air Force Only	Air Force Only		All Services	All Services	All Services

DRAFT Requirements List

	Surgical Strike Adaptable Video and Data Communications Draft Requirements List				
Item	**Requirements**	**Kick-Off Meeting**	**Draft ORD Para.**	**PEP Warrior Para.**	**Trade Studies**
	User Requirements				
1a	Podless		1.0, 1.a, 3.b, 4.		
	Totally new weapon data link standard	x	4.		T1.1, T1.2, T2.1, T2.2, T2.3. T2.4, T2.5, T2.6, T3.1, T3.2
3	Real time Command/Control Data/Video RF DL for Imagery and Coordinates	x	1.0, 1.a, 1.b, 4.a1	2.1	T1.1, T1.2
31	Support other data types (SAR/LADAR/EO, TBD) or data other than images	21 Feb 96			T1.1, T2.2 T2.3
2	Backward compatible with AN/AWW-13		1.a,		
	Larger Number of simultaneous "Channels" than AWW-13		3.a.5		
6	High display resolution -minimize quality degradation. Higher Video quality than AN/AWW-13 - quality sufficient to identify targets		4.a5, 1.d, 3.a.7		T1.1, T1.2
4	Non-Interference with other avionics		4.a2,		T3.1, T3.7
5	No new aircraft antennas (objective)		4. a4		T3.3
10a	Low cost with COTS products and Proc.		4.a9		
8	Aviation Environment Carrier Operations (E^3 Environments)		4.a7		
	Objective: Compatible with USAF and foreign aircraft		6.c		
	Avionics to be common to many platforms		4.	x	T3.3.1, T3.3.2, T*
10b	Maximize use of existing avionics		4.a9		
	Goal: No new aircraft Boxes installable into current avionics (implies cards)		1.c		
	Repackageable configurations		1.c	x	
	Lower weight than AN/AWW-13 Pod		3.a.1	x	
	Cannot Occupy a weapon station (note: covered by Podless requirement)		3.a.2	x	
	Minimize adverse effect on the survivability of existing and future aircraft.		3.a.3, 4.a.4	x	
	Cannot have adverse jettison properties (Note: podless requirement = no jettison)		3.a.4	x	
	Minimize impact radar cross section		3.a.3	x	

DRAFT Requirements List

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Item	Requirements Cont'd	Kick-Off Meeting	Draft ORD Para.	PEP Warrior Para.	Trade Studies
	Operational Requirements				
	Two way communication (Duplexing/Multiplexing)	x	1.a		
	Terrestrial and airborne platforms (non-satellite). Platforms: aircraft, ships, UAV, PGM's, cruise missiles.	x	1.a, 4.a.2	x	
1c	High A/J		1.0, 1.a, 2.		T2.4
29	Better A/J than IDL				T2.1, T2.4
7	Secure and Non-secure modes for DDL		4.a6		T2.6
26	Intra-Swarm Operability	21 Feb 96			
25	MITL Capability		4.a1	3.4.7	
	Handoff - Multiple Aircraft Can Receive one Weapon Link Information; another aircraft could take over command link duties if required.	x			
	Relay of Data/Video	x	1.b, 3.c, 4.a.2, 4.a.8	x	
	Video, Data, Command, and Relay functions capable of operating independently of each other.		4.a.2	x	
	Other data applications besides Precision Guided Munitions (PGM's)	x	1.a, 3.c	x	
	Communication System Duty Cycle up to 100% as needed. (No maximum limitation on Duty cycle e.g. Link-16)				T2.1, T2.2, T2.3, T2.4
	Cannot Reduce Engagements per sortie or adversely impact sortie rate.		3.a.2	x	
	Compatible with seeker technologies such as Automatic Target Recognition (ATR) and autocueing.	x	4.a.3		
9a	Freeze Frame/Real Time Selectable		4.a8		
	Minimize personnel workload and training requirements (MPT analysis)		5.c		
32	Demonstration Purposes, Acts like AWW-13 1760 Interface	21 Feb 96			

DRAFT Requirements List

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Item	Requirements Cont'd	Kick-Off Meeting	Draft ORD Para.	PEP Warrior Para.	Trade Studies
	System Requirements				
28	Link 16 XMT & RCV Capable Not simultaneous Link 16 and DDL	21 Feb 96			T2.1, T4.1, T4.2
	AXQ-14 Compatible				
	Not Analog Video	x	3.a.8		
14a	Compatible with Mission Planning Systems		4.c, 6.a	4.9	
14b	Compatibility with Data Storage Unit		4.c	4.9	
	Compatible with advanced state-or-the-art image processing techniques to enhance jamming resistance.	x	4.a.3		T1.1, T2.3, T1.2, T2.4, T2.5, T3.2
	Compatible with existing aircraft displays, recording, and transmission avionics		6.c		
12	Operational Availability 99%		4.b2		
13	Mission reliability 99.4% ADT 1000 MFHBF WDT threshold 500 MFHBF		4.b3		
11a	Service time 10 years, no preventative maintenance required		4.b1		
11b	Aircraft Terminal Shelf life at least 20 years		4.b.4		
11c	Aircraft Terminal Service life at least 20 years		4.b.4		
21a	No new PSE Complete checkout via external connections Utilize CASS for fault detection: Fault detection rate $\geq$ 90% Fault isolation rate $\geq$ 85% False alarm rate $\leq$ 10%		5.b		
21c	Utilize CASS for fault detection: Fault detection rate $\geq$ 90% Fault isolation rate $\geq$ 85% False alarm rate $\leq$ 10%		5.b		
20	ADT and WDT BIT		5.a		
22a	BIT Go/No-go reportable to maintenance and aircrew		5.d2		
22b	Periodic BIT Go/No-go		5.d2		
22c	Provide ability to terminate initiated BIT		5.d2		
23	KYK-13 Interface {***Obsolete} and Electronic Key Management System (EKMS) compatible interfaces.		5.d3		T2.6
24	C^3I interface for JSIPS JSIPS-N imagery		6.a		T1.1, T1.2, T4.2
21b	Complete checkout via external connections		5.b		
	Weight (approx.) 50 lbs for Aircraft Install				
	Weight (approx.) 20 lbs for Weapon Install				
	Power Draw on Weapon <500 Watts				
	Power Draw on Aircraft <1000 Watts				
	Volume on Aircraft <700 cu-in				
	Volume on Weapon <350 cu-in				

DRAFT Requirements List

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Item	Requirements Cont'd	Kick-Off Meeting	Draft ORD Para.	PEP Warrior Para.	Trade Studies
	Technologically up-to-date	x	3.a.7	x	
	Growth Potential	x	3.a.7	x	
	High availability		3.a.7	x	
	High reliability		3.a.7	x	
	Highly maintainable		3.a.7	x	
	Number of transmittable commands not limited (allows growth)		4.d.3		
	50% growth capability in (all computing resources) throughput, main memory, storage memory and I/O channels		5.d.1		
	Reprogramable over normal digital interface.		5.d.1		
	Compatible with aircraft digital buss	x	5.d.1, 6.c		
	Use industry standard interface architectures		5.d.4		
	Software written in ADA		5.d.1		
	Performance Requirements				
16	Minimum LOS range of xxx nmi	OPNAV	4.c2		T4.2, T4.3
15	Operational range requirement for AJ from ONI Threat Assessment STAR #017-93 Minimum range ratio for video (?) Minimum range ratio for data (?) Jammer EIRP xx dBw	OPNAV	4.c1		T2.4, T4.1, T4.3
19	≥100 simultaneous data links within a coverage area of xxx nmi communicate on a non interference basis (goal 150)	OPNAV	4.d5		T2.2, T2.3, T3.2, T4.2
18	360 degree transmission/reception for weapons data terminal (WDT) and (ADT)		3.a.9, 4.d4		T3.3, T4.2
17a	Signal Acquisition/reacquisition < 3 sec		4.d3		T2.2, T2.5, T2.6
17b	command latency < 250 msec (objective <100ms)		4.d3		T2.2, T2.5, T2.6
27	1760 Video Interface (same as AWW-13)	21 Feb 96			
9b	100 still frame images stored in memory to be displayed on aircrew command		4.a8		
30	Graphics Resolution (for Demonstration) 512 x 512 x 8 Image @ 30 Fps				T1.1
	Data rate 10 Megabits/sec Unjammed at xx range.				T1.1, T2.3, T1.2, T2.5
	Data rate 100 kb/s to > 1Mb/s Jammed				T1.1, T2.3, T1.2, T2.4, T2.5, T3.2

DRAFT Requirements List

DATA LINK TECHNICAL INTERCHANGE
EGLIN AFB FL, 28 MAR 96
ATTENDEES

NAME	ORGANIZATION	TITLE	PHONE
ED DELGADO	ASC/YG	SYSTEMS ENG.	904-882-8723 x2132
TOM NOETHEN	ASC/YG	DEP DIR, AGM-130	904-882-9514 x2238
MAJ STEVE PEARSON	ASC/YG	AN/ZSW-1PRGM MGR	904-882-8723 x2009
ROBERT S. LINDSEY	ASC/YG (B3H) TAMS	AN/ZSW-1 PRGM MGR SUPPORT	904-882-8723 x2156
BERT BISHOP	HAC/RCS	AN/AXQ-14 SYSTEM ENGR	803-531-7982
BOB BALCERAK	HARRIS	IDL PMO	407-768-4407
JACK BURGESS	HARRIS	WEAPONS BD	407-729-7232
BILL STRUTH	HARRIS	IDL/ZSW-1 SYSTEM ENGR	407-729-3198
DANA ZIMMERLI	HMSC	TECHNICAL DIRECTOR	310-618-1200 x1041
RICH PEER	MCDONNEL DOUGLAS	PRINCIPAL STAFF ENGR	314-233-6152
WAYNE BROOKS	NAWCADIN 45566	AN/AWW-13 SYSTEMS	317-306-3574
KEN KNUDSEN	NAWCWPNS 4KL200E	DATA LINK T&E	805-989-8944
DEL PERRY	NAWCWPNSCL 471120D	DATA LINK MGR	619-939-1028
BUTCH SPOONS	NAWCWPNS 471120D	SYSTEMS ENGR	619-927-3581
BOB BLAKE	ROCKWELL	DEP DIR A&MSD	904-651-2437
RAY CROSS	ROCKWELL COLLINS	SYSTEMS ENGR	319-395-8158
JIM PERKINS	ROCKWELL	MARKETING	319-395-5773
BERNIE ASNER	SVERDRUP/TEAS	ASSOCIATE PRIN ENGR	904-729-6329
JIM DUERS	SVERDRUP/TEAS	SYSTEMS ENGR	904-882-8723 x2239
CLIFF GREER	SVERDRUP/TEAS	ENGR ASSOC	904-882-8723 x2166

ATTACHMENT D

SS/AVDCS Trade Study T1.1
Digital Data Link Requirements for Various Applications
(t_1rlb.doc)

SS/AVDCS Trade Study T3.1
RF Spectrum Allocations
(t_3.doc)

Surgical Strike/Adaptable Video and Data Communication System (SSAVDCS)

Trade Study

T1.1

Digital Data Link Requirements for Various Applications

Prepared For:

Rich Peer, MC 270-1115
P.O. Box 516
McDonnell Douglas Aerospace
St. Louis, MO, 63166
(314) 233-6152
E-Mail rpeer@gwsmtp01.mdc.com

Dr. Charles Creusere
NAWC WPNS China Lake
(619) 939-4285
E-Mail chuck@wavelet.chinalake.navy.mil

POC Rockwell Collins:

Bob Liechty
Systems Engineer
Surgical Strike
(319) 395-1119
FAX (319) 395-4317
E-Mail rbliecht@cacd.rockwell.com

Ray Cross
Systems Engineer
Surgical Strike
(319) 395-8158
FAX (319) 395-4317
E-Mail rlcross@cacd.rockwell.com

Abstract:

The purpose of the digital data link information requirement study is to establish the system level requirements definition for a real-time command and control video/data link for successful transmission of imagery and coordinates. The imagery is to be of a high quality and resolution that supports 512 x 512 pixel resolution. The requirement study will also identify the format and quantity of data for the Joint Service Imagery Processing Suite (JSIPS) and Navy (JSIPS-N), Laser Detection and Ranging (LADAR), and Synthetic Aperture Radar (SAR) data. The results of this study will be used to support analytical analysis for digital data link transmission. This includes concept exploration for a large number of simultaneous users with minimum mutual interference while operating in a jamming environment.

1.0 Requirement Definition Phase for Information Capacity

Shown in Table 1 are some of the high level stated information requirements that have been determined for the Surgical Strike/Adaptable Video and Data Communications System mission requirements. The digital data link requires that the information be supported from a variety of different imagery and data sources.

Requirements	Video Data Link WDT to ADT	Command/Control	LADAR	SAR	JSIPS	JSIPS-N	Others
Video Resolution	512 x 512 x 8 Bpp	N/A					
Frame Rate Fps	Still, 1,5,10,15,30	N/A					
Compression	Yes, CF 50-200	No	Yes	Yes			
Data Rate RF Channel	0.3-1.5 Mbps						
Missile Status/ Coordinates Bits	No	Yes	Yes	Yes	No	No	
FEC	Yes	Yes					
Maximum Permissible Corrected BER	10^{-3} Video 10^{-6} Compression Code Table	10^{-6}					
Encryption	TBD	Yes					
Intra-Swarm Link	Yes, WDT-to-WDT	Yes					
Number of Simultaneous Users	100	Command/Control to one WDT at a time					
Resistant to Mutipath/Fading	Yes	Yes	Yes	Yes	Yes	Yes	
Jam Resistant	Yes	Yes					
Command Latency		0.25 sec					
Backwards Compatibility with AWW-13	Yes	Yes	No	No	No	No	

Table 1

Video/Data Link Information Requirements Matrix

Completion of Table 1 will help to bound the requirements and satisfy the action item numbers 2 and 24. This data will be used with other requirement studies to determine the overall Surgical Strike System requirements. The video compression BER is an initial estimate and will be further addressed in the video compression trade study.

Surgical Strike/Adaptable Video and Data Communication System (SSAVDCS)

Trade Study

T3.1

RF Spectrum Allocations

Prepared For:

Butch Spoons
NAWC-WPNS
China Lake, CA
(619) 927-3581

POC Rockwell Collins:

Bob Liechty
Systems Engineer
Surgical Strike
(319) 395-1119
FAX (319) 395-5429
E-Mail rbliecht@cacd.rockwell.com

Ray Cross
Systems Engineer
Surgical Strike
(319) 395-8158
FAX (319) 395-5429
E-Mail rlcross@cacd.rockwell.com

Abstract:

The purpose of the RF Spectrum Allocations trade study is to search and investigate military frequency bands that may be suitable for the RF digital data link used in surgical strike. The trade study will examine frequency allocations in the 500 MHz to 8 GHz range for military applications. Proposed and existing frequency bands will be examined to determine bandwidth allocation, intended spectrum usage, and the potential for frequency reuse using spread spectrum techniques that induce minimal interference and impact on military tactical communications.

1.0 Introduction

The RF Trade study will focus on planned and future frequency allocations of military RF spectrum for use in the Surgical Strike/Adaptable Video and Data Communication System (SSAVDCS). The frequency range shall include the spectrum from 500 MHz to 8 GHz. The attributes for a surgical strike RF operating band should include wide bandwidth for large processing gain, removal of intentional and non-intentional interferers and the support of 100 simultaneous users. The wide bandwidth is also desirable to combat the effects of Rayleigh and Rician fading, and severe specular multipath. This trade study will focus on spectrum allocations that are compatible with the existing F/A-18 antenna and avionics suite of equipment. Planned or allocated frequency allocations for weapons data links and frequency reuse techniques will minimize the impact to F/A-18 installations Shown in Table 1 are the designated frequency bands of some military communication systems. Completion of this table will help to identify possible frequency usage of the SSAVDCS.

This study shall consider using the existing AN/AWW-13, IDL, AXQ-14, Link-16, CDL bands, and other military frequency bands such as "telemetry" bands. Contact should be made with NTIA and other relevant spectrum control/allocation agencies to gather information and determine what will be required to gain approval for use of these bands for this purpose. Information to be gathered should consider other usage of the band, both military and commercial, and foreign and domestic. The usage of the band information will be used to evaluate the interference impact on the surgical strike digital data communications link from systems not specifically designed to be jammers.

Commercial frequency bands used for terrestrial and satellite communications may also be considered when deemed useful and necessary during armed conflict.

RF Band EW Designation	Existing or Planned Freq Usage CNI, EW,Radar, WDL,C[2]	EIRP Watts	RF Frequency Range MHz	Modulation BW MHz	F/A-18 Compatible	Applicable for FHSS, DSSS Techniques Yes/No	Surgical Strike Potential for 100 Users
C-Band 500-1000 MHz							
D- Band 1000-2000 MHz	MK XII IFF, CNI JTDS, C[2]	50-100 200-1000	1030.1090 969-1206	6 3	Yes Yes	No Yes	No
E-Band 2000-3000 MHz							
F-Band 3000-4000 MHz							
G-Band 4000-6000 MHz							
H-Band 6000-8000 MHz							

Table 1

RF Frequency Spectrum Allocation Table

2.0 Classification

This Table when properly filled out could reflect information of a classified nature and should be handled with the proper security procedures for collection, storing and dissemination.

3.0 Inputs/Outputs

Inputs to the trade study shall be made from visits and correspondence to the Federal Communications Commission (FCC) and the National Telecommunications Information Agency (NTIA). Other world wide frequency allocation information may be obtained from the World Administrative Radio Conference (Allocation of Fixed and Mobile Communication Services).

The output of the trade study shall identify and evaluate military/civilian spectrum that has the highest potential for communication integrity and shall determine the decision criteria for selection of frequency spectrum to be used in the QFD matrix. The trade study shall also identify and evaluate frequency spectrum alternatives for risk assessment.

ATTACHMENT E

Surgical Strike Baseline
Quality Function Deployment (QFD)
Chart
(qfdssrbl.xls)

DESIGN REQUIREMENTS (HOWs)

CUSTOMER REQUIREMENTS (WHATS)	IMPROVEMENT DIRECTION		COLUMN NUMBER	CUSTOMER IMPORTANCE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
					Antennas					Modulation							Jamming					WDT			ADT		
					Omni-Directional Blade	Cavity Backed Antennas	High Gain Phased Array	Bandwdith	Beamwidth	Coherent/Non-coherent	M-Ary Waveforms	FEC	FH/CDMA	DSSS	Data Rate	Encryption	CW	Repeat-Back Jammer	Multi-Tone	Swept Noise/CW	Jammer EIRP	Receiver Sensitivity	Higher EIRP	Modified Link-16	Receiver Sensitivity	Higher EIRP	
	>		Podless System	1																							
	>		Video/Command Data Link/Relay	1																							
	>		Backwards Compatible with AWW-13	2																							
	>		Real Time DL for imagery and coord.	1																							
	>	S	Non-Interference with other avionics	4																							
	>	T	No new aircraft antennas	4																							
	>	A	Encryption mode (secure/nonsecure)	3																							
	>	H	360 degree RCVR/XMIT for WDT/ADT	2																							
	>	W	Min. LOS Range @ 25KFt	2																							
	>		>100 simultaneous users	4																							
	>	K	High Anti-Jam capability	2																							
	>	N	Minimum Range for Video	3																							
	>	I	Minimum Range for Data	3																							
	>	L			○	●	□																				
	>	A	MITL capability	1																							
	>	T	Intra-Swarm operability	4																							
	>	A	C3 Interface for JSIPS, JSIPS-N	4																							
	>		Link 16 XMT/RCV Capable	2																							
	>		Signal Acquisition/reacquisition	3																							
	>		Command latency	3																							
	>		Compatible with Mission Planning Sys	1																							
	>																										
	>		Minimize RCS	3																							
			SPECIFICATION GOALS		Gain > +1 dBLi V-Pol, H-Pol	Gain > +5 dBLi	Gain >+12 dBLi	250 MHz	360, 60, 15 Degrees	QPSK, DQPSK, MFSK	MFSK, MDQPSK	*Convolutional /Reed -Solomon*	SFH 1-4 code symbols/dwell	Processing Gain >10	1 Mb/s Cont., 10 Mb/s Interrupted	EKMS Compatible	10 KW in Band	Pulse Width < 13 usec ?	10-100 Tones	BW 10 MHz	10 KW	-97 dBm @ 20 MHz BW	50-200 Watts	Various Forms TBD	-95 dBm @ 20 MHz BW	200-1000 Watts	
			ABSOLUTE IMPORTANCE																								
			RELATIVE IMPORTANCE																								

LEGEND				
	Matrix	Weights		Arrows
Strong	●	9	Maximize	^
Medium	○	3	Minimize	v
Weak	□	1	Nominal	=

DESIGN REQUIREMENTS (HOWs)

IMPROVEMENT DIRECTION

										Video						Hardware										Program						
	IMPROVEMENT DIRECTION					CUSTOMER IMPORTANCE	Variable Compression Techniques	Memory	Encryption	Variable Frame Rate	Wavelet Compression	Availability	Reliability	Serviceability	Weight	Volume	Electrical Power	Growth	BIT	External Testing via connectors	Development Cost	Production Cost								
				COLUMN NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CUSTOMER REQUIREMENTS (WHATS)	>		High Display Resolution, 512x512@30		2																							
	>		Freeze Frame/Real Time Selectable		2																							
	>		Store 100 freeze frames		4																							
	>		Video Support of LADDER/SAR/EO		4																							
	>		Demo, Acts like AWW-13 1760 Interfa		5																							
	>		Common Avionics to other Platforms		4																							
	>		ADT and WDT BIT		1																							
	>					□																						
	>					●																						
	>					○																						
	>		EKMS compatible Interface		2																							
	>		Utilize CASS for Fault Detection		4																							
	>		Carrier Operations		1																							
	>		Service Life 10 Years, no PM		4																							
	>		Aircraft terminal shelf life 20 years		5																							
	>		Aircraft terminal service life 20 Years		5																							
	>		Operational Availability 99%		3																							
	>		Mission Reliability 99.4%		2																							
			Complete Checkout via External Conn.		2																							
	>																											
	>																											
			Growth Potential 50%		2																							
			Totally New Weapon Data Link Std.		5																							
			SPECIFICATION GOALS			Compression Factor 50-200	>27 MB	Classified	Still, 1, 5,10,15,30 Fps	MDA Algorithm	99%	99.40%	NO PM Shelf/Service life 20 years	ADT < 50 lbs, WDT < 20 lbs.	ADT < 700 cu-in, WDT < 350 cu-in	WDT < 500 Watts, ADT < 1000 Watts	50% in computing, memory, I/O	Go/NO-Go and Periodic BIT	FDR = 90%, FIR = 85%, FAR = 10%	TBD	WDT < $25K							
			ABSOLUTE IMPORTANCE																									
			RELATIVE IMPORTANCE																									

LEGEND

	Matrix	Weights		Arrows
Strong	●	9	Maximize	>
Medium	○	3	Minimize	v
Weak	□	1	Nominal	=

DESIGN REQUIREMENTS (HOWs)

IMPROVEMENT DIRECTION

									Integrated Avionics						Interoperability															
	IMPROVEMENT DIRECTION				CUSTOMER IMPORTANCE	Modified JTIDS, MIDS Terminal	Digital Bus	Aircraft-to-Aircraft Transfer Link	Integrated Software	Module Replacement	Aircraft-to-Aircraft DL	Joint Service Compatible																	
			COLUMN NUMBER			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CUSTOMER REQUIREMENTS (WHATS)	>	WHATS	Goal, no new aircraft boxes	3																								
	>		Hand-Off capability to other aircraft	2																								
	>		Compatible with seeker ATR tech.	4																								
	>		Number of XMT commands not limited	2																								
	>		Compatible with aircraft digital bus	2																								
	>		Common avionics to other platforms	4																								
	>		Software written in ADA	3																								
	>		Compatible with USAF and Foreign A	3																								
	>																											
	>																											
	>	LINK				●	□	○																				
	>																											
	>																											
	>																											
	>																											
	>																											
	>																											
	>	DATA																										
	>																											
	>																											
	>																											
			SPECIFICATION GOALS				TBD																					
			ABSOLUTE IMPORTANCE																									
			RELATIVE IMPORTANCE																									

LEGEND	Matrix	Weights		Arrows
Strong	●	9	Maximize	^
Medium	○	3	Minimize	v
Weak	□	1	Nominal	=